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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES



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Typical Report Citation and Abstract

- ❶ **19970001126** NASA Langley Research Center, Hampton, VA USA
- ❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
- ❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
- ❹ Mar. 1996; 130p; In English
- ❺ Contract(s)/Grant(s): RTOP 505-68-70-04
- ❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
- ❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10° to 50°, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65° swept forebody serrations tended to roll together, while vortices from 40° swept serrations were more effective in generating additional lift caused by their more independent nature.
- ❽ Author
- ❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

1. Document ID Number; Corporate Source
2. Title
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AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 471)

AUGUST 10, 1998

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LIFE SCIENCES (GENERAL)

19980200899 Defence Research Establishment Suffield, Ralston, Alberta Canada

Background Aerosol Characteristics Measured with a Fluorescence Aerodynamic Particle Sizer: Sensitivity of FLAPS Performance

Ho, Jim, Defence Research Establishment Suffield, Canada; Spence, Mel, Defence Research Establishment Suffield, Canada; Mar. 1998; 23p; In English

Report No.(s): AD-A342348; DRES-SM-1504; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

From observations done with flow cytometry, it was found that a single spore in liquid stream could be induced to fluoresce at 34060 run. In a prototype instrument, similar results were obtained when spore particles in air were excited with a CW UV laser. The current instrument, Fluorescence Aerodynamic Particle Sizer (second generation FLAPS2) measures particle size as well as intrinsic fluorescence characteristics of individual particles in an aerosol stream. Laser light at UV wavelength is used to preferentially excite aerosol material of a selected size range. The measured fluorescence signals represent intrinsic biological properties of the particles. By this method, it has been shown that inert particles like sand can be distinguished from biological particles like spores and vegetative bacteria. This instrument and its prototype have been demonstrated to effectively detect and characterize biological aerosols during joint field trial exercises in both 1995 and 1996. Integral with the FLAPS design is an aerosol concentrator that provides about 400-500 times normal ambient concentration. This makes it possible to sample at a rate of 3 seconds and within this period, about 300-3000 total particles are processed. To function effectively as a biological detector, the instrument compares background or ambient data to that of an unknown cloud. An ambient aerosol database from diverse localities will greatly enhance data analysis. To this end, the instrument has been used to collect data on ambient aerosols in different geographical sites, for example at DRES, Calgary, Dugway, Cornwall and a spot downwind from a cattle feedlot. The results show that FLAPS can distinguish between clean and "dirty" environments with respect to the fraction of fluorescent particles measured in a given aerosol population.

DTIC

Fluorescence; Ultraviolet Lasers; Aerosols; Size Distribution; Particle Size Distribution; Continuous Wave Lasers; Laser Applications; Measuring Instruments

19980201286 Army Research Inst. of Environmental Medicine, Military Nutrition and Biochemistry Div., Natick, MA USA

Thermoregulatory, Endurance and Ultrastructural Effects of Acute and Subchronic Pyridostigmine Bromide Administration in the Exercising Rat

Matthew, Candace B., Army Research Inst. of Environmental Medicine, USA; Bowers, Wilbert D., Jr., Army Research Inst. of Environmental Medicine, USA; Sils, Ingrid V., Army Research Inst. of Environmental Medicine, USA; Francesconi, Ralph P., Army Research Inst. of Environmental Medicine, USA; Mar. 1998; 25p; In English

Contract(s)/Grant(s): 3M162787A875

Report No.(s): AD-A339025; USARIEM-TR-T98-11; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Pyridostigmine (PY) is the drug currently approved for chemical agent prophylaxis. Previous studies have demonstrated that acute administration or high doses of PY have resulted in thermoregulatory, endurance and ultrastructural abnormalities. In this study the effects of acute (APY, 100 ug/kg, iv) and subchronic PY for 2, 3, and 4 weeks (PY2, PY3, PY4, 20 ug/hr, via osmotic pump) administration on treadmill endurance when measured in rats to determine whether any voluntary muscle weakness occurs as a result of PY administration. APY rats had reduced endurance time (56±18 min (mean±SD) vs 72±17) compared to saline controls and increased core temperatures at the start of exercise (T_c, 38.9 ± 0.2°C vs 38.5 ± 0.6°C). These decrements were ameliorated with subchronic administration, and PY2 animals maintained lower T_c than SAL2 animals. Typical mitochondrial

lesions detected with acute high doses of PY (1mg/kg were not observed in any of these specimens. Decrements in endurance and thermoregulation and ultrastructural abnormalities previously seen with acute PY are not evident after subchronic administration for up to 4 weeks.

DTIC

Temperature Control; Thermoregulation; Physical Exercise; Endurance; Abnormalities; Drugs; Bromine Compounds

19980201353 Michigan Biotechnology Inst., Lansing, MI USA

Extreme Biocatalyst Culture Collection for Unique Microorganisms Final Report, 27 Aug. 1994 - 31 Dec. 1997

Jain, Mahendra K., Michigan Biotechnology Inst., USA; Zeikus, J. G., Michigan Biotechnology Inst., USA; Dec. 31, 1997; 3p; In English

Contract(s)/Grant(s): N000014-94-1-1206

Report No.(s): AD-A339396; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

To develop an Extreme Biocatalyst Culture Collection (EBCC) as a resource center to supply pure, viable and authentic cultures of extremophilic microorganisms which are non-conventional, novel, or of extreme nature; to improve various long-term preservation methods for these types of cultures.

DTIC

Microorganisms; Cultural Resources

19980201391 Edgewood Research Development and Engineering Center, Aberdeen Proving Ground, MD USA

Using Sequence Analysis to Identify Cultures Derived from Airborne Spores

Wick, Charles H., Edgewood Research Development and Engineering Center, USA; Yeh, Homer R., Edgewood Research Development and Engineering Center, USA; Cline, Erica, Washington Univ., USA; Edmonds, Robert L., Washington Univ., USA; Jan. 1998; 33p; In English

Contract(s)/Grant(s): 10262384A553

Report No.(s): AD-A339362; ERDEC-TR-461; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this project was to evaluate rDNA sequencing in identifying airborne fungal spores. Universal fungal small subunit (SSU) ribosomal RNA primers were used with the polymerase chain reaction (PCR) to amplify the SSU rRNA gene from each isolate for sequencing. Sequences were analyzed through the ribosomal database project to identify the most closely related known rDNA sequence. Restriction fragment length polymorphisms (RFLPs) were obtained from three cultures to be used to detect each culture in mixed samples. Of the five stock cultures studied, one common fungus could be identified to genus with some confidence (*Mucor*). For three cultures, sequence data yielded closest matches that were probably closely related genera (*Penicillium*, *Aureobasidium*, *Spongipellis*), but the phylogenetic tree lacked the resolution for genus identification, whereas sequence results from the one culture were more ambiguous. The RFLP analysis could detect the presence of some cultures in mixed DNA isolates, with varying degrees of sensitivity. Although there are not yet enough published sequences to identify less common airborne fungi using sequencing of the SSU rDNA gene, our results indicate that the molecular methods evaluated in this study could have the potential to identify fungal spores from common genera and detect them in mixed environmental samples.

DTIC

Ribonucleic Acids; Deoxyribonucleic Acid; Fungi

19980201767 Scripps Research Inst., Dept. of Chemistry and Molecular Biology, La Jolla, CA USA

Specialization of the DNA-Cleaving Activity of a Group I Ribozyme Through In Vitro Evolution

Tsang, Joyce, Scripps Research Inst., USA; Joyce, Gerald F., Scripps Research Inst., USA; Journal of Molecular Biology; 1996; ISSN 0022-2836; Volume 262, pp. 31-42; In English

Contract(s)/Grant(s): NAGw-2881; NIH-AI-30882

Report No.(s): NASA/CR-96-207598; NAS 1.26:207598; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

In an earlier study, an in vitro evolution procedure was applied to a large population of variants of the Tetrahymena group I ribozyme to obtain individuals with a 10(exp 5)-fold improved ability to cleave a target single-stranded DNA substrate under simulated physiological conditions. The evolved ribozymes also showed a twofold improvement, compared to the wild-type, in their ability to cleave a single-stranded RNA substrate. Here, we report continuation of the in vitro evolution process using a new selection strategy to achieve both enhanced DNA and diminished RNA-cleavage activity. Our strategy combines a positive selection for DNA cleavage with a negative selection against RNA binding. After 36 "generations" of in vitro evolution, the evolved population showed an approx. 100-fold increase in the ratio of DNA to RNA-cleavage activity. Site-directed mutagenesis experiment confirmed the selective advantage of two covarying mutations within the catalytic core of ribozyme that are largely responsi-

ble for this modified behavior. The population of ribozymes has now undergone a total of 63 successive generations of evolution, resulting in an average 28 mutations relative to the wild-type that are responsible for the altered phenotype.

Author

Deoxyribonucleic Acid; Physiology; Mutations; Ribonucleic Acids

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

19980197473 Naval Postgraduate School, Monterey, CA USA

ATB Program and Its Applications to Biodynamic Response Simulation of Underwater Explosion Events

Oglesby, Douglas B., Naval Postgraduate School, USA; Shin, Y. S., Naval Postgraduate School, USA; Mar. 1998; 203p; In English Report No.(s): AD-A342931; NPS-ME-98-002; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

The application of the Articulated Total Body Model Program, and the associated Generator of Body Data (GEBOD), VIEW and IMAGE programs, to the study of biodynamic responses of anthropomorphic test devices and humans to excitations resulting from underwater explosion events is investigated. An overview of each program is presented, and then a single example is followed through the entire modeling and simulation process. Validation and extension of the model, as well as two- and three-dimensional visualization of the predicted body motion, are discussed.

DTIC

Biodynamics; Underwater Explosions; Simulation

19980197480 Army Aeromedical Research Lab., Fort Rucker, AL USA

A Review of the Relationships Among Sleep, Sleep Deprivation, and Exercise Final Report

LeDuc, P. A., Army Aeromedical Research Lab., USA; Caldwell, J. A., Jr., Army Aeromedical Research Lab., USA; Apr. 1998; 32p; In English

Report No.(s): AD-A342896; USAARL-RN-98-25; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This review looked at some of the problems associated with conducting sleep and exercise studies. The impact of factors such as age, gender, fitness level of subjects, and duration and intensity of exercise have been examined. In general, the beneficial effects of exercise on sleep are most pronounced if the exercise is aerobic, conducted in the late afternoon, and of a moderate duration. Disruptive effects are seen when exercise is too close to bedtime or of extremely long durations. With regards to sleep loss and performance, declines in physical and motor performance appear to be influenced more by changes in psychological factors such as mood and perceived exertion than by changes in physiological factors such as blood pressure and heart rate. Literature examining the interaction of sleep deprivation/restriction and exercise on cognitive, physiological, and psychological performance was also investigated. In the majority of studies examining the effects of exercise in sleep deprived subjects, exercise is typically used as a stressor. Articles examining the positive or alerting effects of exercise in sleep deprived/restricted subjects are much less common.

DTIC

Sleep Deprivation; Physical Exercise; Blood Pressure; Psychological Factors; Heart Rate; Sleep

19980200898 Army Research Inst. of Environmental Medicine, Thermal and Mountain Medicine Div., Natick, MA USA

Fluid Replacement Recommendations for Training in Hot Weather, Aug. 1997 - Apr. 1998

Latzka, William A., Army Research Inst. of Environmental Medicine, USA; Montain, Scott J., Army Research Inst. of Environmental Medicine, USA; Sawka, Michael N., Army Research Inst. of Environmental Medicine, USA; Apr. 1998; 35p; In English Report No.(s): AD-A342352; USARIEM-T98-17; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Current U.S. Army fluid replacement guidelines emphasize fluid replacement during hot weather training to prevent degradation of performance and minimize the risk of heat injury. Little consideration has been given to possible over hydration and development of water intoxication. Sufficient epidemiological evidence is available to demonstrate that there is an increasing incidence of water intoxication during military training. This technical report presents revised fluid replacement guidelines for use during hot weather training. It summarizes the development and validation of the fluid replacement guidelines. The end product is an easy to read table that provides the user with the appropriate hourly work time and fluid intake to support work during hot weather training.

DTIC

Dehydration; Hot Weather; Exercise Physiology; Education

19980200901 London Univ., King's Coll. School of Medicine, UK

A Controlled Epidemiological and Clinical Study into the Effect of Gulf War Servicemen and Women of the UK Armed Forces Annual Report, 1 Jun. 1996 - 31 May 1997

Wessely, Simon, London Univ., UK; Jun. 1997; 85p; In English

Report No.(s): AD-A342346; DAMD17-96-1-6185; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This is the 1st annual progress report of a 3 year epidemiological study into the effects on health of service in the Persian Gulf War. During the period June 1996 to June 1997, the questionnaire to be used in the study has been devised. A detailed pilot study has been undertaken, with resulting changes being made to the questionnaire. The questionnaire is comprehensive, with questions looking at background factors, theatres of operation, exposures, and health outcomes. In addition, an extensive database of literature has been developed, covering papers concerned with the effect of war on individuals, plus research pertaining specifically to the Persian Gulf War. Currently, the main body of study is underway, with 12750 questionnaires having been or in the process of being dispatched to currently serving or ex military personnel. Tracing procedures have been extensively investigated and algorithms devised. Problems have been encountered during the year, at the level of the Ministry of Defence and the quality of addresses being released by the armed forces. Considerable manpower has been taken up ensuring that addresses received were in a suitable format for mailing purposes. Political developments have also impinged on the project. Her Majesty's Government announced funds for research into the Gulf War Syndrome, which resulted in our study being held back as it was deemed desirable that all UK research proceeds in an integrated fashion.

DTIC

Epidemiology; Signs and Symptoms; Warfare; Persian Gulf; Armed Forces; Clinical Medicine

19980200970 Edgewood Research Development and Engineering Center, Aberdeen Proving Ground, MD USA

Heat Stable Enzymes from Thermophiles Final Report, Mar. 1995 - Mar. 1997

Williamson, Michael, Edgewood Research Development and Engineering Center, USA; Budwill, Karen, Idaho Univ., USA; Combia, Joan, J. K. Research, USA; Albert, Fred, J. K. Research, USA; Runnion, Kenneth, J. K. Research, USA; Feb. 1998; 76p; In English

Contract(s)/Grant(s): DAAM01-95-C-0029

Report No.(s): AD-A342616; ERDEC-CR-252; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Alkaline phosphatase is widely used in the military and civilian sectors. Commercially available enzyme from calf intestine is the weak link in many applications, breaking down when exposed to elevated temperatures or after being stored for prolonged periods. An extremely heat stable alkaline phosphatase produced by a thermophilic bacterium had been previously identified. The major deficiency was a low specific activity. Research described in this report focused on increasing the specific activity of the heat stable enzyme. This was successfully accomplished by cloning the alkaline phosphatase gene from the wild type into E. coli. One 40-kd cloned product was purified to near homogeneity by nickel affinity chromatography of the N-terminal histidine tagged protein. Purified, cloned alkaline phosphatase exhibited good activity and was thermally stable.

DTIC

High Temperature; Enzymes; Thermal Stability; Escherichia; Thermophiles

19980201004 Florida Univ., Dept. of Physiological Sciences, Gainesville, FL USA

Role of Corticosteroids in Bone Loss During Space Flight Final Report

Wronski, Thomas J., Florida Univ., USA; Halloran, Bernard P., California Univ., USA; Miller, Scott C., Utah Univ., USA; 1998; 23p; In English

Contract(s)/Grant(s): NCC2-825

Report No.(s): NASA/CR-1998-208220; NAS 1.26:208220; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The primary objective of this research project is to test the hypothesis that corticosteroids contribute to the adverse skeletal effects of space flight. To achieve this objective, serum corticosteroids, which are known to increase during space flight, must be maintained at normal physiologic levels in flight rats by a combination of adrenalectomy and corticosteroid supplementation via implanted hormone pellets. Bone analyses in these animals will then be compared to those of intact flight rats that, based on past experience, will undergo corticosteroid excess and bone loss during space flight. The results will reveal whether maintaining serum corticosteroids at physiologic levels in flight rats affects the skeletal abnormalities that normally develop during space flight. A positive response to this question would indicate that the bone loss and decreased bone formation associated with space flight are mediated, at least in part, by corticosteroid excess.

Author

Bone Demineralization; Corticosteroids; Musculoskeletal System; Hormone Metabolisms

19980201036 Geological Survey, Midwest Science Center, Columbia, MO USA

Development of Monitors for Assessing Exposure of Military Personnel to Toxic Chemicals, 8 Jan. 1997 - 7 Jun. 1998

Petty, J. D., Geological Survey, USA; Feb. 1998; 85p; In English

Contract(s)/Grant(s): MIPR-97MM7720

Report No.(s): AD-A342238; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The research conducted during this reporting period involves five areas: (1) continued development of the SPMD technique for integrative sampling of hydrophobic chemicals, (2) evaluation of a deployment apparatus for use with SPMD samplers, (3) continued development of an integrative sampling approach for toxic metals and initiation of the development of an integrative sampler for volatile metals, specifically mercury vapor, (4) initiation of development of an integrative sampling approach for more hydrophilic chemicals, and (5) evaluation of extracts from standard SPMDs deployed in the field using a variety of bioassay procedures to determine the applicability of incorporating the SPMD sampling technique into exposure assessment paradigms. Progress was made in all areas. SPMD sampling rate data for OC pesticides and the priority pollutant PAHs was summarized. A prototype deployment apparatus was obtained and the evaluation was positive. An integrative sampler for divalent metals was developed employing a controlled constant release chelator. Initial efforts in developing an integrative sampler for hydrophobic chemicals were promising. Extracts from field deployed SPMDs were successfully incorporated into bioassay procedures. Each area is addressed individually.

DTIC

Toxicity; Exposure; Contaminants; Bioassay; Chemicals

19980201193 NASA Ames Research Center, Moffett Field, CA USA

Noninvasive Intracranial Volume and Pressure Measurements Using Ultrasound Annual Report, 1 Feb. 1997 - 31 Jan. 1998

Hargens, A. R., NASA Ames Research Center, USA; Mar. 1998; 25p; In English

Contract(s)/Grant(s): DAMD17-97-I-7012

Report No.(s): NASA/TM-1998-208353; NAs 1.15:208353; AD-A339344; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Prevention of secondary brain injuries following head can be accomplished most easily when intracranial pressure (ICP) is monitored. However, current measurement techniques are invasive and thus not practical in the combat environment. The Pulsed Phase Lock Loop (PPLL) device, which was developed and patented, uses a unique, noninvasive ultrasonic phase comparison method to measure slight changes in cranial volume which occur with changes in ICP. Year one studies involved instrument improvements and measurement of altered intracranial distance with altered ICP in fresh cadavera. Our software was improved to facilitate future studies of normal subjects and trauma patients. Our bench studies proved that PPLL output correlated highly with changes in path length across a model cranium. Cadaveric studies demonstrated excellent compact, noninvasive device for monitoring changes in intracranial distance may aid in the early detection of elevated ICP, decreasing risk of secondary brain injury and infection, and returning head-injured patients to duty.

Author

Intracranial Pressure; Cranium; Brain; Injuries; Prevention; Ultrasonics

19980201205 Cincinnati Univ., OH USA

Female Reproductive Effects of Exposure to Jet Fuel at U.S. Air Force Bases Annual Report, 15 Oct. 1996 - 14 Oct. 1997

Lemasters, Grace K., Cincinnati Univ., USA; Nov. 1997; 66p; In English

Contract(s)/Grant(s): DAMD17-96-2-6015

Report No.(s): AD-A338804; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

One of the prevalent exposures at all Air Force (AF) bases is to jet fuel. Total consumption ranks in the billions of gallons. Jet fuel is composed of aliphatic/aromatic hydrocarbons and traces of metals that have potential adverse effects on health including menstrual disorders infertility, spontaneous abortions, and fetal effects. The mean age of active enlisted female Air Force personnel is 27.6 This study addresses whether or not women are experiencing menstrual systems related to their work place from fuel exposures. This study evaluates environments and internal dose measurements of jet fuel components during the course of each woman 5 usual work activities.

DTIC

Armed Forces (USA); Females; Health; Jet Engine Fuels

19980201209 Interior Dept., Columbia, MO USA

Development of Physiological and Behavioral Measures of Acute Chemical Neurotoxicity, 8 Jan. 1997 - 7 Jan. 1998

Jones, Susan B., Interior Dept., USA; Little, Edward E., Interior Dept., USA; Feb. 1998; 73p; In English

Contract(s)/Grant(s): MIPR-97MM7721

Report No.(s): AD-A342235; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

U.S. military personnel may be exposed to a wide variety of potentially toxic chemicals. Examples include deployments in developing countries, and combat conditions in a variety of circumstances. The chemicals personnel may encounter, particularly in combat situations, often are neurotoxicants. Predeployment screening methods such as behavioral and physiological measurements can be used to rapidly assess these potential health hazards. The objectives of this research were to evaluate physiological and behavioral endpoints of neurotoxicity in fish following exposure to selected chemicals (the organophosphates malathion and diazinon), and to assess the correlation between physiology and behavior. Results indicated consistent trends between swimming behaviors (distance and speed swam, rate of turning, and tortuosity of path) and concentrations within and across exposure times. Similar results occurred with measurement of cholinesterase activity. A trend was observed with muscarinic cholinergic receptor number consistent with changes in cholinesterase activity. More importantly, there was a significant correlation between behavioral and physiological endpoints for malathion, but not diazinon. These results support sentinel monitoring as a screening method for neurotoxicity prior to troop deployment. This report summarizes research completed in year one. In the second year, we will assess effects of other chemical classes and mixtures of chemicals.

DTIC

Behavior; Exposure; Organic Phosphorus Compounds; Cholinesterase; Cholinergics

19980201320 Oklahoma Univ., Norman, OK USA

Workshift and Antihistamine Effects on Task Performance Final Report

Gilliland, Kirby, Oklahoma Univ., USA; Schlegel, Robert E., Oklahoma Univ., USA; Nesthus, Thomas E., Civil Aeromedical Inst., USA; Dec. 1997; 100p; In English

Contract(s)/Grant(s): DTFA-02-93D-93088

Report No.(s): AD-A340510; DOT/FAA/AM-97/25; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

Sixteen male subjects, well trained on a battery of cognitive performance assessment tasks, participated in a study to investigate the effects on human operator performance of work shift (Day Shift vs. Mid shift), a specific antihistamine drug (4 mg of ChlorTrimeton(registered) brand chlorpheniramine maleate), and time on task accompanying three successive drug doses spaced every four hours. Five performance tasks, two work sample tasks, and four subjective scales were included in the study. In summary, chlorpheniramine maleate alone had a strong negative influence on a wide range of task performance and mood measures. There was a rather complex relationship between work shift and time on the shift such that performance and mood during the Day Shift tended to get better and during the Mid shift tended to get worse. No evidence was found that chlorpheniramine maleate and work shift combine to produce a multiplicative effect.

DTIC

Circadian Rhythms; Operator Performance; Human Performance; Electric Batteries; Antihistaminics

19980201328 Tripler Army Medical Center, Honolulu, HI USA

Cardiovascular Control of and Responses to Vasoconstrictor Hormones During Hypoxia, 1 Feb. 1995 - 17 Jul. 1997

Claybaugh, John R., Tripler Army Medical Center, USA; Aug. 1997; 13p; In English

Contract(s)/Grant(s): 95MM5571

Report No.(s): AD-A338263; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of these studies is to determine factors affecting blood pressure (BP) maintenance during hemorrhage and the consequences on O₂ delivery (O₂ del). The scope covers the cardiovascular, oxygen delivery, and hormonal responses to hemorrhage while breathing hyperoxic, normoxic and hypoxic air mixtures, in conscious goats. Additionally, the role of the hormonal responses, particularly vasopressin (AVP) and angiotensin II, on the cardiovascular and O₂ del responses is being investigated. We have shown that a controlled hemorrhage at 0.5 ml/kg/min for 30 min conducted in the same goats while exposed to either 11, 21, and 100% FIO₂, reduced mean arterial BP by approximately 25, 15, and 5 mmHg respectively. Improved maintenance of BP during hyperoxia was achieved, in part, by an earlier rise in systemic vascular resistance, and O₂ consumption was similar in all experiments following hemorrhage. Presence of the spleen did not affect the magnitude of drop in BP, O₂ del, nor hormonal responses to the hemorrhage during normoxic conditions. Other experiments involved responses to i.v. infusions of AVP during

11 or 21% FIO₂. AVP increased the arterial O₂ concentration during hypoxia as expected, but the AVP-induced decrease in cardiac output prevented an improvement in O₂ del. Neither hypoxia nor the rate of AVP infusion affected whole body AVP clearance.

DTIC

Cardiovascular System; Hypoxia; Blood Pressure; Deoxidizing; Vasoconstriction

19980201358 Jackson (Henry M.) Foundation, Rockville, MD USA

Heat Tolerance and Exertional Heat Illness in Female Military Recruits *Annual Report, 18 Sep. 1996 - 17 Sep. 1997*

Wenger, C. B., Jackson (Henry M.) Foundation, USA; Oct. 1997; 34p; In English

Contract(s)/Grant(s): DAMD17-95-1-5052

Report No.(s): AD-A342198; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We studied healthy recruits (controls), and recruits with exertional heat illness (EHI) during basic training. We copied pertinent clinical and training records on all identified EHI cases during this reporting period, numbering approximately 100 cases-fewer than usual but the 1997 hot season was cooler than usual until mid-August. Unlike past years, when most EHI cases occurred during the first 4 weeks of training, and while running, 40% of EHI cases occurred during a 52-h exercise, the "Crucible" in file 11th (next-to-last) week of training. The Crucible, new this year, involved no significant running, but includes two 9-mile marches with pack, with no more than 4 hours sleep a night. In 20 healthy recruits, we measured core temperature (T-core) with swallowed telemetering sensors from 0500 to 1700 hours each day of one Crucible, and collected 7 blood samples at 12-h intervals, starting the day before. In 80 other recruits in four cohorts, we measured T-core during middle-distance (2.5 to 4 mile) runs at three stages of training, and the final march of the Crucible. We also obtained blood samples on enrollment and initial, final, and recovery sample with each event, for selected clinical measurements and assessments of immune/inflammatory function.

DTIC

Physical Exercise; Females; Heat Tolerance; Sicknesses

19980201430 Army Aeromedical Research Lab., Fort Rucker, AL USA

The Impact of Task Length on Multi-Attribute Task Battery Performance During Sleep Deprivation

Caldwell, John A., Army Aeromedical Research Lab., USA; Ramspott, Stephanie, Army Aeromedical Research Lab., USA; Gardner, Susan J., Army Aeromedical Research Lab., USA; Jan. 1998; 20p; In Afrikaans

Contract(s)/Grant(s): 3O162787A879

Report No.(s): AD-A339399; USAARL-98-10; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Several factors affect the sensitivity to sleep deprivation when taking computerized tests. Two of these are task complexity and duration. Complexity can improve sensitivity by increasing the demands required to complete the task, but it can also decrease sensitivity by improving the subject's motivation. The effects of task duration are more predictable in that longer tests generally are more susceptible to deprivation effects than shorter ones. The impact of test duration on an interesting, but complex aviation simulation was examined here. By breaking down data from 30-minute MATB administrations into the first, second, and third 10-minutes of performance, it was shown that tests shorter than 30 minutes underestimate the impact of sleep loss on performance. This was especially evident in measures of time-out and tracking errors.

DTIC

Electric Batteries; Deprivation

19980201440 Naval Postgraduate School, Monterey, CA USA

Technological and Economic Assessment of Telemedicine: An Example of DOD MEDNET in Region Three

Buker, Kirk L., Naval Postgraduate School, USA; Sep. 1997; 124p; In English

Report No.(s): AD-A340329; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The Department of Defense (DoD) has numerous initiatives underway to improve the health care delivery system within the military. Telemedicine is one of these initiatives that combine images, videos, sounds, and text to enhance the health care providers' ability to diagnosis and treat patients. The Secretary of the Army in October 1994 established, 'The Center for Total Access' as a laboratory for healthcare re-engineering in the military. This thesis is provided as a resource guide to inform those who may become involved with this complex and chaotic field of telemedicine by providing a review of state-of-the-art technology that can support delivery of telemedicine, and by proposing a cost benefit framework for telemedicine configuration design. The material for this thesis was primarily researched utilizing Internet web browsing technologies. A review of the Tri-Service Infrastructure Management Program Office (TIMPO) project (MEDNET) is outlined as working example of a large regional telemedicine I telehealth system which was found to be the most revealing in the study of telemedicine.

DTIC

Economic Analysis; Defense Program

19980201441 Texas Univ., San Antonio, TX USA

Survival Models for Predicting Altitude Decompression Sickness Final Report, Jan. - Jul. 1996

Kannan, Nandini, Texas Univ., USA; Raychaudhuri, Apaarna, Texas Univ., USA; Jan. 1998; 40p; In English

Contract(s)/Grant(s): AF Proj. 7184

Report No.(s): AD-A338089; AL/CF-TR-1997-0030; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Hardcopy, Microfiche

Survival Analysis methods have been used to model the onset of Decompression Sickness (DCS) which occurs routinely as a result of high altitude exposure. Both parametric and nonparametric models were developed. These models were used to predict the risk of DCS for different flight profiles. The risk factors that have a significant effect on the risk of DCS were also identified. Cross validation techniques are provided to examine the goodness of fit of the model. The loglogistic model was modified to incorporate data on bubble grades and times.

DTIC

Decompression Sickness; Altitude Sickness; Mathematical Models

19980201448 Civil Aeromedical Inst., Oklahoma City, OK USA

Index to FAA Office of Aviation Medicine Reports: 1961 through 1997, 1961-1997

Collins, W. E., Civil Aeromedical Inst., USA; Wayda, M. E., Civil Aeromedical Inst., USA; Jan. 1998; 82p; In English

Report No.(s): AD-A339254; DOT/FAA/AM-98/1; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

An index to Federal Aviation Administration Office of Aviation Medicine Reports (1964-1997) and Civil Aeromedical Institute Reports is presented for those engaged in aviation medicine and related activities. The index lists all FAA aviation medicine reports published from 1961 through 1997: chronologically (pp. 1-43), alphabetically by author (pp. 45-52), and alphabetically by subject (pp. 53-75). A foreword illustrates historical aspects of the Civil Aeromedical Institute's 35 years of service, describes the index's sections, and explains how to obtain copies of published Office of Aviation Medicine technical reports.

DTIC

Civil Aviation; Aviation Psychology

19980201454 Washington Univ., Dept. of Surgery, Seattle, WA USA

The Role of Apoptosis in Hypoxie Endothelial Cell Injury Final Report, 1 May 1995 - 30 Apr. 1996

Winn, Robert K., Washington Univ., USA; Feb. 24, 1998; 8p; In English

Contract(s)/Grant(s): N00014-95-1-0784

Report No.(s): AD-A340333; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The objective of this report is to investigate the regulation of programmed cell death (apoptosis) in hypoxia resistant endothelial cells and hypoxia sensitive hepatoma cells. We will examine the cyto- protective role of Bcl-2 homologues in endothelial cells. Likewise, we will examine the ability of ICE and the ICE-like protease CPP32/YAMA to produce apoptosis.

DTIC

Hypoxia; Protease

19980201522 Civil Aeromedical Inst., Southwest Region Medical Div., Oklahoma City, OK USA

Bloodborne Pathogens in Aircraft Accident Investigation Final Report

Salazar, G. J., Federal Aviation Administration, USA; DeJohn, C. A., Civil Aeromedical Inst., USA; Hansrote, R. W., Civil Aeromedical Inst., USA; Key, O. R., Civil Aeromedical Inst., USA; Nov. 1997; 13p; In English

Report No.(s): AD-A340366; DOT/FAA/AM-97/21; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Occupational Safety and Health Administration (OSHA) amended 29 CFR Part 1910 in 1991 to include regulations addressing occupational exposure to bloodborne pathogens (BBP). The rule affects all employees who have the potential for occupational exposure to these pathogens. An accident scene presents significant challenges in terms of implementing a program which was primarily envisioned to affect personnel in "traditional" healthcare delivery facilities; the OSHA requirements now had to be met in the chaotic, inhospitable, and logistically difficult environment of an aircraft accident site.

DTIC

Microorganisms; Occupational Diseases; Pathogens; Health; Safety

19980201573 Princeton Univ., NJ USA

Physics Utilizing Spin-Polarized Gases Final Report, 1 Oct. 1994 - 30 Sep. 1997

Happer, W., Princeton Univ., USA; Sep. 30, 1997; 5p; In English

Contract(s)/Grant(s): F49620-94-1-0466; AF Proj. 2301/DS

Report No.(s): AD-A339190; AFRL-SR-BL-TR-98-0239; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The research supported by this grant was focused on applications of laser-polarized He-3 and Xe-129 in magnetic resonance imaging and on the basic physics that makes this possible. During the past few years, magnetic resonance imaging of human lungs with laser-polarized He-3 and Xe-129 is being done with increasing frequency at a growing number of sites throughout the world. The resulting lung images are of unprecedented resolution and they clearly show pathologies that are more poorly diagnosed, if at all, by currently available modalities like x-rays or gamma-ray scintillography. A very important consideration in the use of laser-polarized He-3 and Xe-129 is that the nuclear spins of these gases do not relax at the surface of the container in which they are pumped or stored. This research has shown that in the case of Xe-129 in cells with polymer wall coatings, much of the relaxation is due to unusually long trapping of the Xe-129 atoms at sites surrounded by protons in the polymer.

DTIC

Helium Isotopes; Xenon 129; Lasers; Polarization (Charge Separation); Imaging Techniques; Gamma Rays; Magnetic Resonance

19980201598 Civil Aeromedical Inst., Oklahoma City, OK USA

Selection of an Internal Standard for Postmortem Ethanol Analysis

Canfield, D. V., Civil Aeromedical Inst., USA; Smith, M. D., Civil Aeromedical Inst., USA; Adams, H. J., Civil Aeromedical Inst., USA; Houston, E. R., Civil Aeromedical Inst., USA; Feb. 1998; 10p; In English

Report No.(s): AD-A339340; DOT/FAA/AM-98/5; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

One mission of the Civil Aeromedical Institute is to determine the concentrations of alcohol in postmortem specimens related to aviation accidents. This requires the ability to identify and quantitate a wide range of alcohols that are produced in postmortem specimens. A headspace gas chromatographic procedure utilizing n-propanol as an internal standard had been used in the past. However, n-propanol has been found in postmortem specimens, making n-propanol an unsuitable specimen for an internal standard in the analysis of postmortem specimens. This study evaluated 3 potential replacement internal standards for postmortem ethanol analysis. Method: A mixture of alcohols commonly found in postmortem specimens was prepared and tested using headspace gas chromatography. Solutions were prepared using the test mix and the new internal standards. Data were collected on the resolution and reproducibility of the proposed new internal standards with the test mix. Postmortem cases collected over the past 8 years were reviewed for the presence of specific volatile compounds. Results: Baseline resolution from the test mix was not obtained with propionaldehyde, while propionic acid methyl ester exhibited degradation over time. T-butanol was found to give baseline resolution from all volatile compounds commonly found in antmortem and postmortem specimens. No t-butanol was found in 2880 fatal pilots analyzed over the past 8 years for the presence of volatiles. Conclusion: t-butanol is a better internal standard for the analysis of alcohols in postmortem specimens than propionaldehyde, n-propanol, and propionic acid methyl ester, and is not produced in postmortem specimens.

DTIC

Quantitative Analysis; Standards; Ethyl Alcohol; Accidents; Concentration (Composition)

19980201607 JAYCOR, San Diego, CA USA

A Health Hazard Assessment for Blast Overpressure Exposures, 26 Feb. 1996 - 25 Oct. 1997

Stuhmiller, James H., JAYCOR, USA; Nov. 1997; 27p; In English

Contract(s)/Grant(s): DAMD17-96-C-6007

Report No.(s): AD-A338269; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

This report describes the status of research to develop a biomechanically-based health hazard assessment for blast overpressure.

DTIC

Jet Blast Effects; Hazards; Overpressure; Health; Exposure; Pressure Effects

19980201608 Defence and Civil Inst. of Environmental Medicine, Downsview, Ontario Canada

Energy Metabolism in Cold-Stressed Females: Implications for Predictive Modeling Annual Report, 1 Oct. 1996 - 30 Oct. 1997

Jacobs, Ira, Defence and Civil Inst. of Environmental Medicine, Canada; Oct. 1997; 59p; In English

Contract(s)/Grant(s): DAMD17-96-C-6128

Report No.(s): AD-A338905; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

This document is a progress report which describes the results from the first of a series of studies carried out to clarify the extent of gender-related differences in physiological responses to cold stress, and to evaluate the potential implications for survival time in the cold. Specifically, this study was designed to clarify the quantity and quality of energy substrate utilization in shivering

female subjects during cold water immersion. The objectives were: to determine the magnitude of metabolic heat production during cold water immersion; to quantify the relative contributions of fat, carbohydrate and protein metabolism to fuelling metabolism; to determine if muscle glycogen is a significant energy source during shivering; to manipulate skeletal muscle glycogen availability and to evaluate the subsequent effects on metabolic rate and body temperature regulation during cold stress. Female subjects were immersed to the neck in 18 deg C water for up to 90 minutes. Their metabolic rate increased to about 3 times resting levels, similar to what was reported for males. About 40% of metabolism was fueled by carbohydrate oxidation. Muscle glycogen was a significant contributor to metabolism. The protocol was not successful in manipulating glycogen availability.

DTIC

Females; Stress (Physiology); Metabolism; Cold Tolerance; Thermoregulation

19980201777 Wheeling Coll., National Technology Transfer Center, WV USA

BMDO Technologies for Biomedical Applications

Zimmerman, J., Wheeling Coll., USA; Dec. 01, 1997; 95p; In English

Report No.(s): AD-A338549; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

In 1996, EMDO and the National Technology Transfer Center/Washington Operations (NTTC/WO) published a special report entitled 'BMDO Technology Applications in Biomedicine'. With an emphasis on biomedical and biotechnical areas, the report detailed more than 60 technology stories that sprang from BMDO support through the SBIR program, the STTR program, the IS&T program and the TA program. This 1997 report again highlights advances in biomedical applications of BMDO technology, covering 32 stories in image processing, optical biopsy, laser treatments, information storage and networks, and biological analyses, among other topics.

DTIC

Image Processing; Bioassay; Technology Utilization; Clinical Medicine

19980201794 Keller Army Community Hospital, West Point, NY USA

A Prospective Evaluation of Stress Fractures/Overuse Injuries in a Population of West Point Cadets Final Report, 1 Dec. 1990 - 30 Sep. 1993

Wade, Charles E., Keller Army Community Hospital, USA; Ryan, John B., Keller Army Community Hospital, USA; Copley, John B., Keller Army Community Hospital, USA; Lindberg, Jill S., Keller Army Community Hospital, USA; Gildengorin, Virginia L., Keller Army Community Hospital, USA; Jul. 1997; 36p; In English

Contract(s)/Grant(s): MIPR-91MM1502

Report No.(s): AD-A339096; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of this study was to examine the effect of physical training in adolescent males and females on the interrelationship of the hypothalamic-pituitary-gonadal axis, bone mineral density, and incidence of stress fractures. Participants consisted of male and female Cadets enrolled at the U.S. Military Academy, West Point, NY. Both male and female Cadets had reduced plasma gonadal steroid levels during an intense period of physical training over the first six months of enrollment at the Academy. Female Cadets had a reduction in BMD with six months. Gains in bone mineral density were not noted until the second year in both males and females. In female Cadets who had persistently low estradiol levels, BMD did not increase over the study. In males with persistently low testosterone concentrations, BMD did not increase and was decreased compared to other subjects. The incidence of stress fractures was 6 percent and did not appear related to hypogonadism or low BMD. Initiation of rigorous physical training results in a period of hypogonadism and absence of BMD gain in both male and female adolescents. Persistence of hypogonadism is associated with attenuated BMD gain in both females and males. The initial incidence of stress fractures is similar in males and females and does not appear related to gonadal hormone levels or BMD. The undertaking by adolescents of rigorous physical training, which reduces gonadal steroid levels and BMD gain, does not appear to result in a significant incidence of stress fractures irrespective of gender.

DTIC

Physical Fitness; Fractures (Materials); Minerals; Pituitary Hormones

19980201807 Colorado State Univ., Dept. of Radiological Health Sciences, Fort Collins, CO USA

Wall Effects Observed in Tissue-Equivalent Proportional Counters

Rademacher, Steven E., Colorado State Univ., USA; Feb. 13, 1998; 197p; In English

Report No.(s): AD-A339189; 97-041D; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

Tissue equivalent proportional counters (TEPC) have been used to measure energy deposition in simulated volumes of tissue ranging in diameter from 0.1 to 10 microns. There has been some concern that the wall used to define the volume of interest could influence energy deposition within the sensitive volume. These 'wall effects' occur because the wall has a density significantly

greater than the cavity gas. Energy deposition measurements were made for 1 GeV/nucleon Fe ions in a TEPC simulating 1, 2, and 3 microns diameter spheres of tissue. The detector was nested within a particle spectrometer that provided identification and flight path of individual particles. Energy deposition was studied as a function of pathlength through the detector. Approximately 25% of the energy transfer along trajectories through the center of the detector escapes the sensitive volume. The response of the detector, for trajectories through the detector, is always larger than calculations for energy loss in a homogenous medium. This enhancement is greatest for trajectories near the cavity/wall interface. An integration of the response indicates that charged particle equilibrium is essentially achieved for a wall thickness of 2.54 mm. However, estimates of LET and quality factor are influenced by these wall effects. Detector response for fragment particles through the detector was found to scale closely to Z^2 for ions of $18 < Z$ changing nuclear interaction occurred in the detector wall was lower than that of the response to particle trajectories not involved in charge-changing nuclear interactions.

DTIC

Radiation Effects; Walls; Particle Trajectories; Spectrometers; Energy Dissipation; Energy Transfer

53

BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

19980201206 Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA USA

Adverse Impact Implications of Selection Instrument Group Score Differences *Final Report, Mar. 1995 - Jun. 1996*

Silva, Jay M., Army Research Inst. for the Behavioral and Social Sciences, USA; Mar. 1997; 20p; In English

Contract(s)/Grant(s): ARI Proj. 20465803D730

Report No.(s): AD-A338809; ARI-SR-97-05; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Human resources decision-makers are concerned when mean inter-group score differences on selection measures are observed. Moreover, they are not concerned with the magnitude of the differences per Se, but rather with whether those score differences will manifest themselves as adverse impact. An analytical approach was used to estimate for various combinations of selection ratio and minority applicant group representation. the maximum group score difference that would not violate the 'four-fifths' rule. In addition. applicant pools of specific sizes with no mean inter-group score difference on the selection measure were considered to compute the conservative likelihood of encountering an adverse impact situation in a specific applicant sample. The results clearly suggest that the identification of adverse impact and its statistical substantiation will often occur in small applicant pools (i.e. -. 100), even when there is a small inter-group difference on the selection measure. For larger samples (i.e., 500), the results suggest that adverse impact will often be indicated when small mean inter-group selection measure differences are present. It is not clear to what degree the adverse impact found would be statistically substantiated. Research focusing on adverse impact and its statistical substantiation is needed for specific inter-group difference/applicant pool size combinations to create a clearer equivalence between intergroup differences and adverse impact.

DTIC

Systems Engineering; Management Methods; Management Planning

19980201242 Krug Life Sciences, Inc., Houston, TX USA

Visual Scene Effects on the Somatogravic Illusion *Interim Report, Apr. - Jul. 1997*

Lessard, Charles S., Krug Life Sciences, Inc., USA; Previc, Fred H., Armstrong Lab., USA; Self, Brian, Armstrong Lab., USA; Beer, Jeremy, Systems Research Labs., Inc., USA; Dec. 1997; 27p; In English

Contract(s)/Grant(s): F33615-92-C-0018; AF Proj. 7184

Report No.(s): AD-A342155; AL/CF-TR-1997-0141; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The somatogravic illusion is a dangerous illusion that is believed to have caused a large number of mishaps in civilian and military aviation over the years. This illusion is usually experienced during forward acceleration, which creates a backward inertial force that combines with gravity to produce a resultant gravito inertial vector rotated backward from the pilot; hence, the pilot perceives a pitching up of the aircraft. The false climb illusion demonstrates the limitations of the otolith organs in providing accurate information to the brain, when there is insufficient visual information to correct the misinformation; hence, the objective of this research was to determine the relative importance of various visual scene cues in achieving visual dominance over nonvisual orientational inputs. The three orientational cues that were presented in both isolation and in various combinations were perspective splay, texture flow, and a horizon line. All of the visual scene cues were designed to depict level flight in the face of a pitch up somatogravic illusion (SGI). It was hypothesized that some visual cues would be more effective than others in reducing the magnitude of the perceived somatogravic pitch up illusion when compared to the eyes closed SGI condition. No significant differ-

ences were observed between the perceived pitch during the eyes closed and any of the other visual conditions. The results suggest that the scenes may have been too basic, not bright enough, or not as realistic as a bright daytime scene.

DTIC

Visual Perception; Disorientation; Visual Stimuli; Climbing Flight; Psychological Effects; Biological Effects

19980201270 Battelle Memorial Inst., Columbus, OH USA

Effects of Stress on Judgment and Decision Making *Final Report, May - Nov. 1991*

Hammond, Kenneth R., Battelle Memorial Inst., USA; Doyle, James K., Battelle Memorial Inst., USA; Sep. 1997; 163p; In English

Contract(s)/Grant(s): DAAL03-86-D-0001

Report No.(s): AD-A338724; ARI-RN-97-34; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This monograph (Part II) is the second of a planned three-part series. Following Part I, which examines four literatures related to judgment and decision making (J/DM) under stress, Part II narrows its focus to a detailed treatment of stress within the J/DM literature. Six sections are included: (a) an introduction, bridging Parts I and II, (b) a consideration of two principal topics (rationality and performance) in the J/DM literature in relation to stress, (c) an examination of current textbooks, anthologies, and reviews, as well as books and articles in the human factors field, with regard to their treatment of stress and J/DM, (d) a description of current J/DM theories and models and their potential utility for the study of J/DM under stress, (e) an examination of methodological issues bearing on research on J/DM under stress, and (f) the outline of a new approach intended to advance theory and method. The general conclusion drawn from the examination of the aforementioned material (including an additional several hundred articles not cited) is the same as that drawn from the work in Part I, namely, research is lacking in coherent theoretical background, diffuse in content, and completely lacking in secure generalizations. If progress is to be made with regard to this topic, critically important to the military and other sections of society, a resolute, comprehensive effort will have to be made, theoretically, methodologically, and empirically. Part 3 (forthcoming) will consist of an attempt to meet these goals.

DTIC

Decision Making; Management Planning; Problem Solving

19980201280 Ohio State Univ., Columbus, OH USA

An Evaluation of Pilot Acceptance of the Personal Minimums Training Program for Risk Management *Final Report*

Jensen, Richard S., Ohio State Univ., USA; Guilkey, James E., Ohio State Univ., USA; Hunter, David R., Federal Aviation Administration, USA; Feb. 1998; 22p; In English

Report No.(s): AD-A340338; DOT/FAA/AM-98/6; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A new general aviation training program entitled, 'Personal Minimums for Aviator Risk Management in Pre Take off Decisions' was field tested in five diverse geographic locations around the USA (Columbus, OH; Long Beach, CA; Anchorage, AL; Baltimore, MD/Washington, DC; and Chicago, IL) to determine its acceptability to pilot audiences and to obtain feedback for further development of the intervention. In each case, following the presentation, participants were asked to evaluate the course and its acceptability to the general aviation community. Analysis of these evaluations revealed that respondents viewed the training program as helpful and intended to use personal minimums as part of their pre flight decision making in the future. Respondent comments and feedback from local FAA personnel at each of the field sites resulted in progressive modifications to the training format and presentation to improve its acceptance and utility throughout the course of the field test. It is recommended that development proceed with video and computer based versions of this training program and that studies of the training impact be conducted, possibly in concert with the dissemination of the program throughout the FAA safety seminar program.

DTIC

Flight Training; General Aviation Aircraft; Aircraft Pilots; Decision Making

19980201296 Armstrong Lab., Human Resources Directorate, Brooks AFB, TX USA

Male and Female Causal Models of Pilot Skill Acquisition: A Preliminary Evaluation *Interim Report, Jan. 1996 - Apr. 1997*

Carretta, Thomas R., Armstrong Lab., USA; Ree, Malcolm J., Armstrong Lab., USA; Sep. 1997; 19p; In English

Contract(s)/Grant(s): AF Proj. 1123

Report No.(s): AD-A339589; AL/HR-TP-1997-0033; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Based on a previous study, a causal model of acquisition of pilot job knowledge and flying skills was tested on separate samples of male and female students. Causal model parameters were estimated separately for each sample and, due to the small sample size for females, no between groups statistical tests were conducted. The results are viewed as tentative because of the small sample of female students, however, the path coefficient parameter estimates are still useful. The model showed a direct influence of general cognitive ability on the acquisition of job knowledge and an indirect influence on the acquisition of flying skills. The direct

and indirect influence of cognitive ability on flying skills was a little stronger for females than for males. Additionally, the path between prior job knowledge and flying performance was somewhat stronger for females than for males. Consistent with previous findings, the influence of early flying skills on later flying skills was very strong. No argument for a sex separated training syllabus is supported.

DTIC

Human Performance; Males; Females; Mental Performance; Pilot Training

19980201297 Armstrong Lab., Cognitive and Performance Div., Brooks AFB, TX USA

Cognitive and Psychomotor Abilities: A Further Investigation of Their Relationship *Interim Report, Feb. - Mar. 1996*

Carretta, Thomas R., Armstrong Lab., USA; Ree, Malcolm J., Armstrong Lab., USA; Sep. 1997; 21p; In English

Contract(s)/Grant(s): AF Proj. 1123

Report No.(s): AD-A339603; AL/HR-TP-1997-0004; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A study was conducted to expand our understanding of the relationship between cognitive and psychomotor abilities. The tests were administered as might occur in personnel selection and classification. A paper-and-pencil multiple aptitude battery and a wide-ranging, computer-based psychomotor test battery were administered to 429 male and female military recruits. A confirmatory factor analysis yielded the higher order factors of general cognitive ability (g) and psychomotor / technical knowledge (PM/TK). The PM/TK factor was interpreted as representing Vernon's (1969) practical factor (k:m) (see P.E. Vernon, *Intelligence and Cultural Environment*, London: Methuen). In the joint analysis of these two batteries, g and PM/TK each accounted for about 31% of the common variance. No residualized lower order factor accounted for more than 7%. The higher order PM/TK factor influenced a broad range of lower order psychomotor factors.

DTIC

Storage Batteries; Abilities; Mental Performance; Psychomotor Performance

19980201365 Minnesota Univ., Dept. of Psychology, Minneapolis, MN USA

Psychomotor and Perceptual Abilities and Skilled Performance *Final Report, 15 Feb. 1996 - 14 Dec. 1997*

Ackerman, Phillip L., Minnesota Univ., USA; Dec. 1997; 9p; In English

Contract(s)/Grant(s): F49620-96-1-0065; AF Proj. 2313

Report No.(s): AD-A339294; AFRL-SR-BL-TR-98-0244; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The research in this project is aimed at three broad approaches to development and assessment of psychomotor and perceptual speed ability predictors of skilled performance: The first approach takes advantage of computerized touch panel device for assessment of a series of psychomotor abilities. The second approach links individual differences in psychomotor abilities with perceptual speed abilities, which have been shown to be important predictors of the acquisition of skilled performance. The third approach evaluates the new test batteries for predicting individual differences in complex task performance. The program of research is proceeding on schedule, in that the touchpanel technology has been acquired, seven new families of psychomotor tests have been developed and subjected to empirical assessment, and perceptual speed tests have been developed and incorporated into a larger aptitude ability framework. The new tests show substantial promise in accounting for important sources of performance variance, and are currently being subjected to validation trials for complex task performance criteria.

DTIC

Procedures; Psychomotor Performance; Human Performance

19980201411 Michigan Univ., Div. of Research Development and Administration, Ann Arbor, MI USA

Insights into Working Memory from The Perspective of The EPIC Architecture for Modeling Skilled Perceptual-Motor and Cognitive Human Performance *Interim Report, 1 Jan. 1992 - 1 Jan. 1998*

Kieras, David E., Michigan Univ., USA; Meyer, David E., Michigan Univ., USA; Mueller, Shane, Michigan Univ., USA; Seymour, Travis, Michigan Univ., USA; Jan. 01, 1998; 44p; In English

Contract(s)/Grant(s): N00014-92-J-1173

Report No.(s): AD-A338746; TR-98-ONR-EPIC-10; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

Computational modeling of human perceptual-motor and cognitive performance based on a comprehensive detailed information-processing architecture leads to new insights about the components of working memory. To illustrate how such insights can be achieved a precise production system model that uses verbal working memory for performing a serial memory-span task through a strategic phonological loop has been constructed with the Executive-Process/ Interactive-Control (EPIC) architecture of Kieras and Meyer. The model accounts well for empirical results from representative memory-span studies The success of this

account stems from five central features of EPIC that may be compared and contrasted with those of other currently popular alternative theoretical frameworks.

DTIC

Information Processing (Biology); Mental Performance; Verbal Communication; Memory

19980201518 Michigan Univ., Div. of Research Development and Administration, Ann Arbor, MI USA

Concurrent Response Selection in Dual-Task Performance: Evidence for Adaptive Executive Control of Task Scheduling Interim Report, 1 Jan. 1992 - 1 Jul. 1997

Schumacher, E. H., Michigan Univ., USA; Lauber, E. J., Michigan Univ., USA; Glass, J. M., Michigan Univ., USA; Zurbriggen, E. L., Michigan Univ., USA; Gmeindl, L., Michigan Univ., USA; Jul. 01, 1997; 40p; In English

Contract(s)/Grant(s): N00014-92-J-1173

Report No.(s): AD-A338747; DRDA-TR-97; ONR-EPIC-09; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

Four experiments with the psychological refractory period (PRP) procedure are reported that investigate how people perform multiple tasks concurrently. In each experiment, a primary task was paired with a secondary task that had two levels of response-selection difficulty. Experiments 1 and 2 varied response-selection difficulty by manipulating the number of alternative stimulus-response (S-R) pairs in the secondary task. In both experiments, the effect of this factor on secondary-task reaction times (RTs) decreased reliably as the stimulus onset asynchrony (SOA) decreased. Experiments 3 and 4 varied response-selection difficulty by manipulating S-R compatibility for the secondary task. Again, the effect of this factor on secondary-task RTs decreased reliably as SOA decreased, regardless of whether or not the primary and secondary tasks involved the same response modality. Taken together, these results raise doubts about the existence of an immutable structural central bottleneck in response selection. Rather, it appears that response-selection processes for two concurrent tasks may temporally overlap. This outcome is consistent with dual-task performance models under which people have adaptive executive control of their task-scheduling strategies.

DTIC

Reaction Time; Task Complexity; Adaptive Control; Refractory Period; Human Performance; Performance Prediction; Cognitive Psychology

19980201554 Synergia, Redwood City, CA USA

Computational Models of Human Organization Dynamics Final Report

Dourand, Gregg, Synergia, USA; Fehling, Michael, Synergia, USA; Feb. 28, 1998; 54p; In English

Contract(s)/Grant(s): MDA972-97-C-0001; ARPA Order-E495

Report No.(s): AD-A339769; COD-4; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

We describe a prototype environment for computational modeling of social systems, ACCORD. We also present the theoretical foundation, Generative Practice Theory, and the methodology we have developed, Practice Mapping, to acquire the necessary information about the social system (e.g., an organization), develop its computational realization, validate the models via formal experimentation, and develop implications of the models. We have tested our research in several crisis response domains.

DTIC

Mathematical Models; Asymptotic Properties

19980201557 Louisiana State Univ., Dept. of Medicine, New Orleans, LA USA

Brain's Stress Axis: A Possible Predictor for the Quality of Mental Performance During Chronic Stress Final Report, 1 Sep. 1994 - 31 Aug. 1997

Prasad, Chandan, Louisiana State Univ., USA; Aug. 1997; 6p; In English

Contract(s)/Grant(s): F49620-94-1-0446; AF Proj. 3484

Report No.(s): AD-A339177; AFRL-SR-BL-TR-98-0217; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Briefly, through the research outlined in this proposal we had hoped to achieve following specific goal. to develop a biochemical measure that will predict the quality of mental performance under conditions of acute and chronic stress. to identify such a predictor, we will examine the relationship between the secretion of adrenal as well as adrenal modulated hormones (dehydroepiandrosterone, corticosterone, progesterone, pregnenolone and allopregnenolone) and a variety of behavioral tests for emotionality and anxiety, and cognition under normal and stress conditions. During the course of this study, however, we observed that under stress free conditions, rats exhibit a wide animal to animal variation in two of the behavioral measures, the Porsolt's test for despair and the Elevated plus maze test for anxiety, that we had proposed to use. Therefore, we have decided to characterize the nature of this variation first and then look for biochemical predictors in different subsets of animals. of all the adrenal hormones consid-

ered, DHE appeared to be very promising. Therefore, the rest of the studies were largely focussed on DHEA and its role in stress anxiety.

DTIC

Mental Performance; Adrenal Gland; Hormones; Anxiety

19980201589 Defence and Civil Inst. of Environmental Medicine, Downsview, Ontario Canada

The Temporal Consistency of the Effects of Structure and Content on Spatial Deductive Reasoning

Dec. 1997; 42p; In English

Report No.(s): AD-A339196; DCIEM-97-R-69; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The general aim of this study is to elucidate the temporal consistency of the effects of the structure and content of an argument on spatial deductive reasoning. We will investigate the effects of these factors mainly by comparing the opposing predictions made by the Formal Rules theory and the Mental Models theory of spatial deductive reasoning. Thirty-seven subjects solved 48 spatial reasoning problems which varied by their logical structure, that is, by the order of the entities in the premise sets, and their geometrical content, that is, by the number of dimensions (2D, 3D), orientations (horizontal, vertical), and directions (right/left, bottom/top) specified in the premise sets. For half of the problems, subjects were to deduce the relative location of an object pair (EB) in two dimensions. For the other half, subjects were to deduce the relative location of an other object pair (ED) in either one dimension, for the 2D condition, or in three dimensions for the 3D condition. Questions pertaining to each dimension were asked consecutively thus requiring deductions over time but within the bounds of working memory. We varied the symbolic representation of the problems according to their symbolic structure using either sentences or diagrams to represent the relations among entities, and their symbolic content using either nouns or images to represent the entities. We addressed temporal consistency by measuring the effects of the above variables on the responses and the response times obtained for the consecutive questions. Spatial deductions were reliably easier to make from diagrams than from sentences, thus confirming the Mental Models theory. However, diagrams facilitated spatial reasoning only during the initial stage of the process of deduction.

DTIC

Consistency; Position (Location); Spatial Resolution; Human Performance

19980201750 Civil Aeromedical Inst., Office of Aviation Medicine, Oklahoma City, OK USA

Automation in General Aviation: Two Studies of Pilot Responses to Autopilot Malfunctions Final Report

Beringer, Dennis B., Civil Aeromedical Inst., USA; Harris, Howard C., jr, Civil Aeromedical Inst., USA; Dec. 1997; 26p; In English

Report No.(s): AD-A340243; DOT/FAA/AM-97/24; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Study 1 examined four automation related malfunctions (runaway pitch trim up, roll servo failure, roll sensor failure, pitch drift up) and subsequent pilot responses. Study 2 examined four additional malfunctions; two more immediately obvious (runaway pitch trim down, runaway roll servo) and two subtler (failed attitude indicator, pitch sensor drift down) than those in Study 1, and the effect of an auditory warning. Data collection was performed in the Civil Aeromedical Institute's Advanced General Aviation Research Simulator, configured as a Piper Malibu. Results suggest that maladaptive responses to some of these failures may, in a significant percentage of cases, lead to significant altitude loss, overstress of the airframe, disorientation of the pilot, or destruction of the aircraft. Percentages of successful recoveries, detection/correction times, and related indices of performance are discussed in the context of malfunction type, flight profile, and auditory alerts.

DTIC

Automatic Pilots; Airframes; Attitude Indicators; General Aviation Aircraft; Servomechanisms

19980201785 Naval Health Research Center, San Diego, CA USA

The Variability of Electrophysiological and Neurobehavioral Measures of Alertness in Women and Men Final Report, 22 Dec. 1995 - 1 Apr. 1997

Neri, David F., Naval Health Research Center, USA; May 1997; 94p; In English

Contract(s)/Grant(s): MIPR-96MM6651

Report No.(s): AD-A338742; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The routine requirement of continuous manning in the armed forces means military personnel must frequently perform their jobs for extended periods, at all hours of the day and night, often under monotonous conditions. Much research has shown that such working conditions often produce fatigue, decreased alertness, and compromised performance. As various military operations increasingly involve women there is a need to identify and characterize any gender-related differences in the pattern and dynamics of alertness and performance decrements caused by night work and sleep loss. This study addressed whether men and women show dissimilar patterns of fatigue-related performance decrements. Neurobehavioral and/or electroencephalographic

(EEG) measures of alertness and performance were collected in 32 women and 24 men during a night of sleep deprivation. Detailed between-gender comparisons were made of the neurobehavioral measures of low alertness, including patterns of response rate, accuracy, and lapse probability. Gender variability was also explicitly examined in similar neurobehavioral measures previously collected in a series of lengthy sleep deprivation/restriction protocols. Results from both sets of investigations failed to detect any reliable differences in cognitive performance and alertness between men and women as a function of sleep loss. Although there appear to be some gender-related response style differences, the present data do not support distinguishing between men and women in their ability to withstand the effects of sleep deprivation. The EEG data analysis is ongoing and will be described in subsequent reports.

DTIC

Electroencephalography; Military Operations; Alertness; Mental Performance; Females; Neurophysiology

19980201805 Federal Aviation Administration, William J. Hughes Technical Center, Atlantic City, NJ USA

Effect of Free Flight Conditions on Controller Performance, Workload, and Situation Awareness

Endsley, Mica R., Federal Aviation Administration, USA; Mogford, Richard H., Federal Aviation Administration, USA; Alenderfer, Kenneth R., Federal Aviation Administration, USA; Snyder, Michael D., Federal Aviation Administration, USA; Stein, Earl S., Federal Aviation Administration, USA; Dec. 1997; 53p; In English

Report No.(s): AD-A340228; DOT/FAA/CT-TN97/12; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Free flight represents a major change in the way that aircraft are handled in the National Airspace System. It has the potential to significantly increase airspace utilization and, by doing so, improve aircraft throughput. The degree to which these objectives can be met without compromising aircraft safety will depend on appropriate changes in the air traffic control system. This study provides an evaluation of some of the potential effects of free flight on controllers' ability to maintain an accurate and complete picture of the traffic situation. This picture or mental representation is essential for monitoring and separation functions. The study revealed that, using current technology, some aspects of free flight may adversely influence the situation awareness and performance of controllers. The results provide information on some possible consequences of free flight that should be explored in future research.

DTIC

Workloads (Psychophysiology); National Airspace System; Free Flight; Flight Control; Flight Conditions; Aircraft Safety

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.

19980197299 NASA Johnson Space Center, Houston, TX USA

Multimodal Perception and Multicriterion Control of Nested Systems, 2, Constraints on Crew Members During Space Vehicle Abort, Entry, and Landing

Riccio, Gary E., Nascent Technologies Ltd., USA; McDonald, P. Vernon, Wyle Labs., Inc., USA; Irvin, Gregg E., Nascent Technologies Ltd., USA; Bloomberg, Jacob J., NASA Johnson Space Center, USA; Apr. 1998; 40p; In English

Report No.(s): NASA-TP-1998-3703; NAS 1.60:3703; S-835; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report reviews the operational demands made of a Shuttle pilot or commander within the context of a proven empirical methodology for describing human sensorimotor performance and whole-body coordination in mechanically and perceptually complex environments. The conclusions of this review pertain to a) methods for improving our understanding of the psychophysics and biomechanics of visual/manual control and whole-body coordination in space vehicle cockpits; b) the application of scientific knowledge about human perception and performance in dynamic inertial conditions to the development of technology, procedures, and training for personnel in space vehicle cockpits; c) recommendations for mitigation of safety and reliability concerns about human performance in space vehicle cockpits; and d) in-flight evaluation of flight crew performance during nominal and off-nominal launch and reentry scenarios.

Author (revised)

Visual Control; Human Performance; Biodynamics; Cockpits; Flight Crews

19980197474 Army Aeromedical Research Lab., Fort Rucker, AL USA

Optical and Biodynamic Evaluation of the Helmet Integrated Display Sight System (HIDSS) for the RAH-66 Comanche Development and Validation Program Phase Final Report

Harding, T. H., Army Aeromedical Research Lab., USA; Beasley, H. H., Army Aeromedical Research Lab., USA; Martin, J. S., Army Aeromedical Research Lab., USA; Rash, C. E., Army Aeromedical Research Lab., USA; McLean, W. E., Army Aeromedical Research Lab., USA; Mar. 1998; 42p; In English

Contract(s)/Grant(s): 30162787A879

Report No.(s): AD-A342921; USAARL-RN-98-22; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Development and Validation phase Helmet Integrated Display Sight System (HIDSS) for the RAH-6E Comanche was evaluated. The HIDSS consists of an integrated helmet, a helmet-mounted display consisting of a right and a left multifunction display, a helmet tracking system, a boresight reticle unit, and the associated electronics. The evaluation consisted of biodynamic, optical, and visual performance measures. Measurements show that the HIDSS fails to provide acceptable weight and center of mass performance. At a value of 2.62 kg, the head supported weight exceeds the maximum allowable value. Image quality was acceptable except for the areas of contrast ratio (shades of gray), luminance uniformity, and modulation transfer function. Additional human factors engineering concerns surfaced during the evaluation. These included restrictions on pilot head movements due to cathode ray tube size and location, extraneous reflections, single visor configuration, and interpupillary distance extreme adjustment effect on monocular operation.

DTIC

Biodynamics; Helmet Mounted Displays; Helmets; Visual Perception; Modulation Transfer Function; Image Resolution

19980197475 Army Aeromedical Research Lab., Fort Rucker, AL USA

Ground Troop Helmet Electronic Cable Safety Design Issues Final Report

McEntire, B. J., Army Aeromedical Research Lab., USA; Apr. 1998; 13p; In English

Report No.(s): AD-A342918; USARRL-RN-98-24; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Several development efforts are ongoing to integrate electronic devices onto ground soldier helmets which improve tactical advantages over adversarial forces. These devices often receive electrical signals and power from remote components located on the soldier. While technology is progressing to develop wireless systems to transfer these signals, basic wire technology appears to be the most secure and reliable at this time. These interface cables are tethered between the helmet and torso. These tethered cables introduce new injury risks to combat soldiers which must be addressed during system design. The injury risk is derived from the possibility of catching or snagging the interface cable. Both cable ends are secured, one to the electronic device mounted on the wearer's head or helmet, and the other to some location on the soldier's torso. A snag of the interface cable would introduce loads to the wearer's head and torso which could be transferred to the neck structure. Even with a breakaway connector, it is possible for the connector body to be caught and apply injury producing loads to the wearer. The likely injury loads are those applied to the head and neck structure. Human head and neck tolerance to external loadings are reviewed to establish guidelines for improved safety design. Consideration is given to the various loading conditions and injury mechanisms.

DTIC

Electronic Equipment; Helmets; Systems Engineering; Combat

19980200833 NASA Marshall Space Flight Center, Huntsville, AL USA

NASA Technology Benefits Orthotics Final Report

Myers, Neill, NASA Marshall Space Flight Center, USA; Shadoan, Michael, NASA Marshall Space Flight Center, USA; Apr. 14, 1998; 7p; In English

Contract(s)/Grant(s): RTOP 251-30-01

Report No.(s): NASA/CR-1998-208281; NAS 1.26:208281; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Engineers at NASA's Marshall Space Flight Center (MSFC) in Huntsville, Alabama have designed a knee brace to aid in the rehabilitation of medical patients. The device, called the Selectively Lockable Knee Brace, was designed for knee injury and stroke patients but may potentially serve in many more patient applications. Individuals with sports related injuries, spinal cord injuries and birth defects, such as spina bifida, may also benefit from the device. The Selectively Lockable Knee Brace is designed to provide secure support to the patient when weight is applied to the leg; however, when the leg is not supporting weight, the device allows free motion of the knee joint. Braces currently on the market lock the knee in a rigid, straight or bent position, or by manually pulling a pin, allow continuous free joint motion.

Derived from text

Design Analysis; Supports; Knee (Anatomy); Orthopedics

19980200926 Washington Univ., Human Interface Technology Lab., Seattle, WA USA

Communicating Situation Awareness in Virtual Environments Final Report, 15 May 1993 - 31 Sep. 1997

Wells, Maxwell J., Washington Univ., USA; Apr. 1998; 47p; In English

Contract(s)/Grant(s): F49620-93-1-0339; AF Proj. 3484

Report No.(s): AD-A342567; AFRL-SR-BL-TR-98-0395; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report documents the work conducted by the HIT Lab during a four year project titled Communicating Situation Awareness in Virtual Environments. The project was funded under the MURI (Multi-disciplinary University Research Initiative), and was intended as spin up funding to allow the Lab to achieve critical mass and momentum. As such, the goals of both the fund providers and fund recipients were successfully achieved. Over the course of the project over 30 experiments were conducted resulting in 76 publications. Support was provided for approximately 20 students, resulting in 9 theses and dissertations. A multi-disciplinary workshop was conducted, and there were active collaborations between researchers in this lab, with other labs, with government agencies and with commercial companies. The benefits of this collaboration are beginning to take effect. The focus of the research effort was tightened during the last year of the project to address five key areas. The results from experiments investigating four of these five areas are presented in this report, along with a cumulative list of all of the publications.

DTIC

Human Factors Engineering; Flight Simulators; Virtual Reality; Environment Simulation

19980200953 Armstrong Lab., Crew Systems Directorate, Wright-Patterson AFB, OH USA

Design of a Windblast Data Acquisition System Interim Report, 1 Mar. - 25 Jul. 1997

Crothers, Brian J., Armstrong Lab., USA; Jul. 1997; 20p; In English

Contract(s)/Grant(s): AF Proj. 3257

Report No.(s): AD-A343061; AL/CF-TR-1997-0186; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Classifying helmets safe to fly is of major importance to the USAF and DoD in general. Helmets are put through numerous rigorous tests before the design is rated flight worthy. One such test is the windblast. This test is designed to simulate the wind's forces and speeds the pilot and helmet will be subject to upon ejecting from a crippled aircraft. Data is collected pertaining to the helmet shift on the head, lift and drag forces experienced by the helmet and it's reaction to them. The Data Acquisition System (DAS), designed and built by AL/CFB utilizing off-the-shelf hardware and software, was used to collect this data. It replaced an older system in which data collected was subject to as much as 30 percent offsets of peak values, was susceptible to noise corruption and was subject to a secondary review costing additional time and money. This report contains detailed information on the design and function of the hardware and software components of the DAS and also a detailed explanation of how the hardware and software processes were validated.

DTIC

Data Acquisition; Wind Velocity; Blast Loads; Performance Tests; Helmets; Design Analysis

19980201062 Core-M, Inc., West Newton, MA USA

Adaptation of Core-M's Electronic Sensory Platform for Monitoring and Control of Physiological and Non-Physiological Devices Employed on the Life Support for Trauma and Transport Annual Report, 28 Oct. 1996 - 27 Oct. 1997

Guler, Faith, Core-M, Inc., USA; Mar. 1998; 7p; In English

Contract(s)/Grant(s): DAMD17-97-C-7004

Report No.(s): AD-A342991; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Core-M has undertaken to design, develop and produce proof of concept models of control and data acquisition system for the LSTAT sled. The architecture for such a system is based on Core-M's unique modular electronic units that are individually programmable for any desired application. Each module has its own memory buffer area to assure real time acquisition and processing of the data collected. The units communicate with each other through 12C protocol, which requires only two wires. This unique approach makes it possible to realize low weight, low power, easy to implement system for LSTAT sled project.

DTIC

Data Processing; Data Acquisition; Life Support Systems; Monitors; Memory (Computers)

19980201103 Mayo Clinic, Rochester, MN USA

Development of an LSTAT Ventilator Final Report, 28 Sep. 1994 - 30 Nov. 1997

Warner, David O., Mayo Clinic, USA; Dec. 1997; 46p; In English

Contract(s)/Grant(s): DAMD17-95-2-5021

Report No.(s): AD-A342957; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

There is a critical need for a small, portable device to provide ventilatory support to critically-ill battlefield casualties. No prior device is available which can operate independently of compressed gas sources and line power. The purpose of this project was to develop a prototype ventilator suitable for incorporation into the Life Support for Trauma and Transport (LSTAT) project. The scope of this work has continued to evolve throughout the project period, as documented in the interim project reports. Originally, it was conceived to be essentially a feasibility study. However, early in the project period it became apparent that WRAIR desired an actual pre- production prototype for incorporation into a prototype LSTAT unit. To meet this goal, we modified the original grant (see attached letter to Dr. Satava explaining this modification, Attachment 1), including a subcontractor (Omni-Tech Medical, Inc.) recommended by WRAIR to actually fabricate the device. As part of the process, initial units were delivered to Northrop Grumman and incorporated into an initial prototype.

DTIC

Ventilation Fans; Product Development; Prototypes; Fabrication

19980201107 Army Aeromedical Research Lab., Fort Rucker, AL USA

Effects of Seat Stroke Distance on the Allowable Mass of Head Supported Devices Final Report

Mobasher, Amir A., UES, Inc., USA; Brozoski, Frederick T., UES, Inc., USA; McEntire, B. J., Army Aeromedical Research Lab., USA; Alem, Nabih M., Army Aeromedical Research Lab., USA; Apr. 1998; 16p; In English

Contract(s)/Grant(s): DA Proj. 301-62787-A-878

Report No.(s): AD-A342941; USAARL-98-26; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The effects of stroking distance of energy attenuating helicopter seat on head supported device (HSD) masses were investigated in various helicopter crash scenarios. The Articulated Total Body (ATB) model was used to simulate the helicopter pilot's biodynamic response to five different crash pulses. Parameters of the simulations included two allowable seat stroking distances (2.5 and 25 cm) and four HSD masses (0.45, 1.4, 2.7, and 4.1 kg). The simulations were performed with the mid-sized Hybrid III manikin as the occupant model, and the HSD center of mass (CM) coincident with the CM of the Hybrid III head. Moments and forces produced by the ATB simulations at the head/neck interface (occipital condyles) were assessed against injury thresholds to determine the risk of neck injury. Acceptable head supported masses were established then for the given impact conditions. The report concludes that acceptable HSD mass was highly dependant on seat stroke distance and impact conditions, which include crash pulse magnitude, direction and shape. For a Hybrid III dummy, increased available seat strokes resulted in lower loads transmitted to the head/neck interface, thereby allowing larger HSD masses to be worn.

DTIC

Human Factors Engineering; Helicopters; Accidents; Seats; Injuries; Biodynamics

19980201108 British Columbia Research Council, Vancouver, British Columbia Canada

Development of a Standard for the Health Hazard Assessment of Mechanical Shock and Repeated Impact in Army Vehicles: Summary of Phases 1-5 Final Report

Cameron, Barbara, British Columbia Research Council, Canada; Morrison, James, British Columbia Research Council, Canada; Robinson, Daniel, British Columbia Research Council, Canada; Roddan, George, British Columbia Research Council, Canada; Springer, Marguerite, British Columbia Research Council, Canada; Apr. 1998; 201p; In English

Contract(s)/Grant(s): DAMD17-91-C-1115; DA Proj. 301-62787-A-878

Report No.(s): AD-A342933; USAARL-CR-98-02; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This study was designed and conducted in five phases between July 1991 and July 1997. The primary objective was to develop a dose-effect model to predict, and ultimately minimize, the risk of injury to a soldier when exposed to the repeated shock environment of tactical ground vehicles (TGVs). Phase 1 reviewed over 1,200 relevant scientific, medical, and military papers. Phase 2 analyzed and characterized the vibration and shock environment of Army TGVs. Based on Phase 2, motion simulations were developed for the experimental phases. Phase 3, a pilot study, determined the most sensitive human response measures to mechanical shock and repeated impact. Phase 4 identified important factors (biomechanical, physiological, biochemical, and subjective responses to motion exposure) to include in the development of a health hazard assessment model. In Phase 5, a health hazard assessment method was developed for mechanical shock and repeated impact in Army vehicles. A series of models were developed and programmed into a graphical user interface to simplify the application the health hazard assessment models to measured seat accelerations. Together, these models predict the risk of injury based on fatigue failure theory.

DTIC

Mechanical Shock; Physiological Responses; Human Reactions; Biodynamics; Hazards; Injuries; Pilots (Personnel); Human Factors Engineering

19980201212 NASA Marshall Space Flight Center, Huntsville, AL USA

Performance Testing of a Trace Contaminant Control Subassembly for the International Space Station

Perry, J. L., NASA Marshall Space Flight Center, USA; Curtis, R. E., Boeing Defense and Space Group, USA; Alexandre, K. L., Boeing Defense and Space Group, USA; Ruggiero, L. L., Boeing Defense and Space Group, USA; Shtessel, N., Boeing Defense and Space Group, USA; 1998; 11p; In English; 28th; International Conference on Environmental Systems, 13-16 Jul. 1998, Danvers, MA, USA

Report No.(s): NASA/TM-97-208262; NAS 1.15:208262; AIAA Paper 98-1621; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

As part of the International Space Station (ISS) Trace Contaminant Control Subassembly (TCCS) development, a performance test has been conducted to provide reference data for flight verification analyses. This test, which used the U.S. Habitation Module (U.S. Hab) TCCS as the test article, was designed to add to the existing database on TCCS performance. Included in this database are results obtained during ISS development testing; testing of functionally similar TCCS prototype units; and bench scale testing of activated charcoal, oxidation catalyst, and granular lithium hydroxide (LiOH). The present database has served as the basis for the development and validation of a computerized TCCS process simulation model. This model serves as the primary means for verifying the ISS TCCS performance. In order to mitigate risk associated with this verification approach, the U.S. Hab TCCS performance test provides an additional set of data which serve to anchor both the process model and previously-obtained development test data to flight hardware performance. The following discussion provides relevant background followed by a summary of the test hardware, objectives, requirements, and facilities. Facility and test article performance during the test is summarized, test results are presented, and the TCCS's performance relative to past test experience is discussed. Performance predictions made with the TCCS process model are compared with the U.S. Hab TCCS test results to demonstrate its validation.

Author

Performance Tests; Subassemblies; Trace Contaminants; Data Acquisition; Data Bases

19980201293 Army Aeromedical Research Lab., Fort Rucker, AL USA

The Effect of Exposure to the AH -64 Combat Mission Flight Simulator On Postural Equilibrium *Final Report*

Braithwaite, Malcolm G., Army Aeromedical Research Lab., USA; Manning, Julius C., Army Aeromedical Research Lab., USA; Groh, Shannon L., Army Aeromedical Research Lab., USA; Jan. 1998; 23p; In English

Contract(s)/Grant(s): 3M162787A879

Report No.(s): AD-A339573; USAARL-98-15; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Simulator sickness syndrome is a form of motion sickness that may occur during the simulator training exercise, immediately after, or sometime later. It may be induced by either physical or visual motion, and symptoms include: nausea, disorientation, ataxia, dizziness, visual problems, headache, depression, and sweating. An important operational problem associated with simulator sickness is the extent to which an individual aviator is incapacitated. This will determine how long after simulator exposure the aviator needs to be grounded. Previous researchers have measured postural equilibrium with standing and walking tests, but there are limitations associated with these tests. A modern method of objective measurement is the Neurocom Pro Balance Master. The purpose of this assessment was to determine the effect of exposure to the AH-64 Combat Mission Simulator (CMS) on postural equilibrium. Six instructor pilots, 42 male student pilots, and 3 female student pilots were tested. The results clearly suggested that student training in the AH-E4 CMS in its present configuration has an insignificant effect on postural equilibrium. A 2-hour period of "grounding" between training in the flight simulator and actual flight is probably adequate. Further assessments should be conducted in field locations.

DTIC

Flight Training; Signs and Symptoms; Flight Simulators; Motion Sickness

19980201427 South Carolina Univ., Columbia, SC USA

Effect of an Airplane Cabin Water Spray System on Human Thermal Behavior: A Theoretical Study Using a 25-Node Model of Thermoregulation

Wolf, Matthew B., South Carolina Univ., USA; Garner, Robert P., South Carolina Univ., USA; Feb. 1998; 22p; In English

Report No.(s): AD-A339365; DOT/FAA/AM-98/4; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This study was conducted to assess the effect of an aircraft cabin water spray system on thermoregulatory responses of passengers after being wetted by the spray system. A mathematical model was developed that could adequately describe experimentally determined transient changes in metabolic rate (MR), and core and skin temperatures of human beings exposed to water-immersion conditions (0 to 280C). The model was the basic 25-node description of Stolwijk and Hardy as modified to apply to a male with medium fat content. The MR increase induced by shivering was described by 3 components sensitive to 1) time-rate of change of skin temperature, 2) the product of changes in skin and head-core temperatures and 3) the product of skin temperature change

and the time-rate of change of head-core temperature. The model was also able to closely predict the changes in MR and skin temperatures induced by exposure to cold air. However, the predictions of rectal temperature changes were in the opposite direction to the experimental data for this case. The model was modified to describe the effects of spraying individuals with water on their heads, arms and torsos to simulate the action of a cabin water spray system activated by a fire in an airplane. The model predicted that an individual, after being sprayed and exiting into a cold and windy environment, would encounter only a minor increase in thermal stress compared to the dry state. We conclude that mathematical simulation is an effective method of predicting thermal behavior of humans under a variety of cold conditions.

DTIC

Temperature Control; Aircraft Compartments; Thermoregulation

19980201431 Armstrong Lab., Crew Systems Directorate, Wright-Patterson AFB, OH USA

EValuation of A Proposed B-2 Seat Cushion by + Gz Impact *Interim Report*

Perry, Chris E., Armstrong Lab., USA; Feb. 1997; 121p; In English

Contract(s)/Grant(s): AF Proj. 7184

Report No.(s): AD-A339408; AL/CF-TR-1997-0112; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Optimal seat comfort is required for aircrew operational effectiveness in all USAF aircraft. Extended missions in ejection seat aircraft must balance comfort with the cushion's influence on the risk of vertebral fracture during ejection. McDonnell Douglas and Northrop Grumman recently designed a proposed seat cushion for the ACES 2 ejection seat in the B-2 aircraft to improve sitting comfort. The Escape and Impact Protection Branch was requested by the San Antonio Air Logistics Center to evaluate potential spinal injury risk with the proposed cushion. A series of vertical impact tests were conducted with volunteer human subjects to compare the impact response of the proposed cushion to a 'no cushion' impact condition, and to the existing B-2 ACES 2 seat cushion. All tests were conducted on the Armstrong Laboratory's Vertical Deceleration Tower using a +Gz peak impact of 100. Test results indicate that the human impact response with the proposed B-2 ACES 2 seat cushion is not significantly different from the response with no seat cushion or with the current B-2 ACES 2 seat cushion. This indicates that the current risk of spinal injury would not increase with the proposed cushion within the limits evaluated.

DTIC

Ejection Seats; B-2 Aircraft

19980201800 Army Aeromedical Research Lab., Fort Rucker, AL USA

Visor Use Among U.S. Army Rotary-Wing Aviators *Final Report*

Rash, Clarence E., Army Aeromedical Research Lab., USA; Mora, John C., Army Aeromedical Research Lab., USA; Ledford, Melissa H., Army Aeromedical Research Lab., USA; Reynolds, Barbara S., Army Aeromedical Research Lab., USA; Ivey, Rebecca H., Army Aeromedical Research Lab., USA; Jan. 1998; 73p; In English

Contract(s)/Grant(s): 3O162787A879

Report No.(s): AD-A340128; USAARL-98-16; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Visors are optical devices that provide a level of comfort and protection from dust, wind, sun glare and particle fragments and, in the case of a crash, from tree branches, rocks, debris and aircraft structural parts. This report presents the results of a survey whose objective was to document visor usage, and identify problems associated with optical quality, and maintenance in Army rotary wing aviation. The survey was distributed to U.S. Army aviators and crewmen at Fort Hood, Texas; Fort Rucker, Alabama; Fort Campbell, Kentucky; and Fort Bragg, North Carolina. The survey identified that guidelines for visor use need to be established. Minor problems with haze, distortion, luminous transmittance, and prismatic deviation were also identified. Other problems include mechanical difficulties, e.g., visors sticking and coming off track, inadequate custom trimming for IHADSS visors, and ANVIS incompatibility. Data support that dual visor design results in higher percentage of visor use.

DTIC

Optical Equipment; Visors; Surveys; Crashes; Protection; Aircraft Structures

19980201803 Arizona State Univ., Dept. of Civil Engineering, Tempe, AZ USA

Diagnostic Tools for the Monitoring and Organization of In-Situ Air Sparging Systems *Final Report, Sep. 1996 - Dec. 1997*

Amerson, Illa L., Arizona State Univ., USA; Feb. 1998; 247p; In English

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In situ air sparging (IAS) involves injecting air into an aquifer to treat trapped contaminant sources, remediate dissolved contaminant plumes, and mitigate dissolved contaminant plume migration. The injected air also provides a source of oxygen for aerobic biodegradation of contaminants. Although the principle of the technology is simple, the practical aspects of effectively

monitoring and optimizing IAS systems remain problematic. Conventional monitoring approaches generally focus on assessing the air distribution within the aquifer. There is a need, however, for methods to measure mass transfer or treatment rates at points within the target treatment zone in order to monitor the system's performance. The goal of this research was to develop diagnostic tools for quantifying mass transfer rates during IAS operation. Experiments have focused on two alternatives: (a) a push-pull test using a multi-component tracer solution, and (b) a continuous ground water pumping test coupled with injecting sulfur hexafluoride through the air injection well. The multi-component tracer solution was developed and tested under controlled experimental conditions in a three-dimensional tank. Both the multitracer solution and the continuous pumping SF₆ test were field tested at the U.S. Navy National Test Site at Port Hueneme, California. The three-dimensional tank and field data indicate that the diagnostic tools are appropriate for assessing mass transfer at IAS sites. Two oxygen transfer rates, one indicating oxygen consumption and one indicating oxygen delivery, have been derived from the tracer test data.

DTIC

Diagnosis; Mass Transfer; Gas Injection; Biodegradation; Air Flow

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